VIDEO DISPLAY APPARATUS WITH ON-SCREEN DISPLAY PIVOTING FUNCTION

BACKGROUND OF THE INVENTION

1. Technical Field

The present invention relates to a video display apparatus with an on-screen display pivoting function. More specifically, the present invention relates to a video display apparatus with an on-screen display pivoting function in which, even when the user arbitrarily pivots the monitor of a computer system, the on-screen display is normally displayed.

2. Related Art

Generally, a video display apparatus such as the monitor of a computer system has functions such that the user can arbitrarily adjust the brightness and size of the picture. In addition, such a video display apparatus typically has an on-screen display (OSD) capability.

Monitors associated with computer systems also have the capability of being rotated by 90 degrees about an axis passing from the front of the monitor to the rear thereof. However, when such rotation is carried out, the OSD on the screen of the monitor also rotates through 90 degrees so that the letters and figures of the OSD appear to be lying on their sides relative to their previous, unrotated appearance.

Thus, as a result of such rotation of the monitor, the user thereof is substantially inconvenienced in that it is difficult for the user to see or accurately view the OSD.

SUMMARY OF THE INVENTION

The present invention is intended to overcome the above described disadvantage.

Therefore, it is an object of the present invention to provide a video display apparatus with an on-screen display pivoting function in which, even when a video display apparatus such as a monitor of a computer system is arbitrarily turned, the on-screen display can be displayed in a normal manner.

In achieving the above object, the video display apparatus with an on-screen display pivoting function according to the present invention includes: an OSD (on-screen display) generating section for receiving horizontal/vertical synchronizing signals and clock signals from an external source, and for outputting first video signals in response to OSD control signals from an outside source; a pivot circuit section for receiving the first video signals, for storing in a position-converting manner a write address of the first video signals in correspondence with a pre-set pivot write address, and for converting the write address in response to the horizontal/vertical synchronizing signals and the clock signals so as to output the first video signals in the form of second video signals; a scale converting section for furnishing the horizontal/vertical synchronizing signals and the clock signals to the OSD generating section and the pivot circuit section, respectively, and for receiving the second video signals so as to convert scales of the second video signals in response to scale control signals from an outside source; and a control section for furnishing OSD control signals and scale control signals to the OSD generating section and to the scale converting section, respectively, in response to OSD driving signals (generated by a user), and for furnishing pivot control signals to the pivot control section in response to mode control signals (also generated by the user).

In another aspect of the present invention, the video display apparatus with an on-screen display pivoting function according to the present invention includes: a power supply section for supplying power; a display section for receiving the power from the power supply section, and for displaying a picture corresponding to video signals externally inputted by a user; a signal converting/clock generating section for receiving horizontal/vertical synchronizing signals and video signals, for converting the video signals to digital signals in response to first control signals (from an outside source), and for outputting clock signals; a decoder for receiving brightness/chromatic signals from an outside source so as to convert the brightness/chromatic signals to digital signals in response to second control signals (from an outside source); a frame rate converting section for receiving the horizontal/vertical synchronizing signals and the video signals from the signal converting/clock generating section, for receiving the brightness/chromatic signals from the decoder, for storing the video signals in response to third control signals (from an outside source), and for converting the video signals (thus stored) to a certain frequency ratio corresponding to display characteristics of a display section; an OSD (on-screen display) generating section for receiving horizontal/vertical synchronizing signals and clock signals from an outside source, and for outputting first video signals in response to OSD control signals from an outside source; a pivot circuit section for receiving the first video signals, for storing in a position-converting manner a write address of the first video signals corresponding to a pre-set pivot write address, and for converting the write address in response to the horizontal/vertical synchronizing signals and the clock signals so as to output the first video signals in the form of second video signals; a scale converting section for furnishing the horizontal/vertical synchronizing signals and the clock signals to the OSD generating section and the pivot circuit section, respectively, for converting scales of video signals of the frame rate converting section, and for receiving the second video signals so as to convert scales of the second video signals of the pivot circuit section in response to scale control signals from an outside source; a control section for furnishing the first, second and third control signals to the signal converting/clock generating section, the decoder and the frame rate converting section, respectively, for furnishing OSD control signals and scale control signals to the OSD generating section and to the scale converting section, respectively, in response to OSD driving signals (generated by a user), and for furnishing pivot control signals to the pivot control section in response to mode control signals (generated by the user); and a driving section for furnishing the video signals and driving signals from the scale converting section to the display section.

In this video display apparatus with an on-screen display pivoting function, even if the screen body is turned by 90 degrees, the letters and figures of the on-screen display are displayed in the normal manner. Therefore, the user can use the on-screen display in a convenient way.

BRIEF DESCRIPTION OF THE DRAWINGS

A more complete appreciation of the invention, and may of the attendant advantages, thereof, will be readily apparent as the same becomes better understood by reference to the following detailed description when considered in conjunction with the accompanying drawings in which like reference symbols indicate the same or similar components, wherein:

FIG. 1 illustrates an on-screen display of a video display apparatus;

FIG. 2 illustrates an abnormal display of an on-screen display when the screen body is turned by 90 degrees;

FIG. 3 is a block diagram showing a video display apparatus with an on-screen display pivoting function according to the present invention;

FIG. 4 is a block diagram showing a pivot circuit section according to the present invention;

FIG. 5 is a block diagram showing another embodiment of the pivot circuit section according to the present invention;

FIGS. 6 and 7 illustrate data maps which are stored in the case where the on-screen display pivoting function of the invention is not utilized;

FIGS. 8 and 9 illustrate data maps which are stored in the case where the on-screen display pivoting function of the present invention is utilized; and

FIG. 10 illustrates the on-screen display displayed in the normal manner by the video display apparatus with an on-screen display pivoting function according to the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

FIG. 1 illustrates an on-screen display of a video display apparatus.

As shown in FIG. 1, the on-screen display function is carried out on a screen **13** when the user manipulates a particular key of a key pad **15** to generate an on-screen display **14**, the key pad **15** being located on a screen body **11** of the video display apparatus **10**.

FIG. 2 illustrates an abnormal display of an on-screen display when the screen body is turned by 90 degrees. As shown in FIG. 2, if the screen body **11** of the video display apparatus **10** is turned by 90 degrees, then the on-screen display **14** on screen **13** is also turned by 90 degrees. Therefore the letters and figures of the on-screen display are laid on their side as viewed by the user. Accordingly, when the screen body **11** of the video display apparatus **10** is turned by 90 degrees, the user encounters a substantial inconvenience.

FIG. 3 is a block diagram showing a video display apparatus with an on-screen display pivoting function according to the present invention; FIG. 4 is a block diagram showing a pivot circuit section according to the present invention; and FIG. 5 is a block diagram showing another embodiment of the pivot circuit section according to the present invention.

Referring to FIG. 3, the video display apparatus with an on-screen display pivoting function according to the present invention includes: a power supply **1000** for supplying power (9 V or 12 V); a display panel **1100** for receiving power from the power supply **1000**, and for displaying a picture of externally inputted R-G-B video signals to a user in response to driving signals; a signal converter/clock generator **100** for receiving horizontal/vertical synchronizing signals H/V SYNC and R-G-B video signals, for converting the R-G-B video signals to digital signals in response to first control signals (from an outside source), for generating clock signals, and for producing output signals **101**; a decoder **300** for receiving brightness/chromatic signals (Y/C) from an outside source so as to convert the brightness/chromatic signals to digital signals **301** in response to second control signals **204** (from an outside source); a frame rate converter **400** for receiving the output signals **101** from the signal converter/clock generator **100**, for receiving the digital signals **301** from the decoder **300**, for storing R-G-B signals in response to third control signals **206** (from an outside source), for converting the R-G-B signals (thus stored) so as to have a certain frequency ratio corresponding to display characteristics of a display panel **1100**, and for generating an output **401**; a frame memory **500** for storing the R-G-B signals for the signal converter/clock generator **100** under the control of the frame rate converter **400**; an OSD (on-screen display) generator **700** for receiving horizontal/vertical synchronizing signals and clock signals **601** from an outside source, and for outputting first R-G-B signals **701** in response to OSD control signals **210** from a controller **200**; a pivot circuit **800** for receiving the first R-G-B signals **701**, for storing in a position-converting manner a write address of the first R-G-B signals **701** in correspondence to a pre-set pivot write address, and for converting the write address in response to the horizontal/vertical synchronizing signals and the clock signals so as to output second R-G-B signals **801**; a scale converter **600** for furnishing the horizontal/vertical synchronizing signals and the clock signals **601** to the OSD generator **700** and the pivot circuit **800**, respectively, for converting scales of video signals of the frame rate converter **400**, and for receiving the second R-G-B signals to convert scales of the second R-G-B signals **801** of the pivot circuit **800** in response to scale control signals **208** from an outside source; a controller **200** for furnishing the first, second and third control signals **202**, **204** and **206**, respectively, to the signal converting/clock generator **100**, the decoder **300** and frame rate converter **400**, respectively, for furnishing OSD control signals **210** and scale control signals **208** to the OSD generator **700** and to the scale converter **600**, respectively, in response to OSD driving signals (generated by the user), and for furnishing pivot control signals **212** to the pivot circuit **800** in response to mode control signals (generated by the user); and a panel driver **900** for receiving the R-G-B signals **602** from the scale converter **600** and furnishing driving signals **901** to the display panel **1100**.

Referring to FIG. 4, the pivot circuit **800** includes: a B-pivot circuit **800*a*** for receiving B-data signals OSD-B of the first R-G-B signals **701** from the OSD generator **700**, for storing in a position-converting manner a write address of the B-data signals OSD-B in correspondence with a pre-set pivot write address in response to pivot control signals **212**, and for converting the write address in response to the horizontal/vertical synchronizing signals and clock signals **601** so as to output the stored B-data signals OSD-B in the form of B-data signals B of the second R-G-B signals **801**; a G-pivot circuit **800*b*** for receiving G-data signals OSD-G of the first R-G-B signals **701** from the OSD generator **700**, for storing in a position-converting manner a write address of the G-data signals OSD-G in correspondence with a pre-set pivot write address in response to pivot control signals **212**, and for converting the write address in response to the horizontal/vertical synchronizing signals and clock signals **601** so as to output the stored G-data signals OSD-G in the form of G-data signals G of the second R-G-B signals **801**; and an R-pivot circuit **800*c*** for receiving R-data signals OSD-R of the first R-G-B signals **701** from the OSD generator **700**, for storing in a position-converting manner a write address of the R-data signals OSD-R in correspondence with a pre-set pivot write address in response to pivot control signals **212**, and for converting the write address in response to the horizontal/vertical synchronizing signals and clock signals **601** so as to output the stored R-data signals OSD-R in the form of R-data signals R of the second R-G-B signals **801**.

Referring to FIG. 5, the B, G and R-pivot circuits **800*a***, **800*b*** and **800*c***, respectively, have the same composition.

The B-pivot circuit **800***a* includes: an analog/digital converter **810** for receiving the B-data signals of the first R-G-B signals **701** from the OSD generator **700** so as to convert them to digital signals; a buffering section **820** for receiving and storing the digital B-data signals from the analog/digital converter **810**, and for outputting previous B-data signals upon receiving next B-data signals from the analog/digital converter **810**; a pivot controller **840** for outputting storing position control signals **841** and data selection control signals **842** in response to pivot control signals **212** from the controller **200**; a data storing section **830** for receiving and storing the B-data signals of the buffering section **820**, and for storing in a position-converting manner a write address of the B-data signals of the buffering section **820** in correspondence with a pre-set pivot write address in response to store position control signals **841**; and a data selector **850** for receiving the B-data signals of the first R-G-B signals **701** or the B-data signals of the data storing section **830** so as to output the B-data signals of the first R-G-B signals **701** or the B-data signals of the data storing section **830** in the form of second R-G-B signals **801**.

Under this condition, the buffering section **820** of the B-pivot circuit **800***a* includes eight buffers **820***a*, **820***b*, **820***c*, **820***d*, **820***e*, **820***f*, **820***g* and **820***h* for storing the 8-bit data of the analog/digital converter **810**.

The compositions of the G-pivot circuit **800***b* and the R-pivot circuit **800***c*, respectively, are the same as that of the B-pivot circuit **800***a*. Further, the buffering sections of the G-pivot circuit **800***b* and the R-pivot circuit **800***c*, respectively, are the same as that of the B-pivot circuit **800***a*.

Now the operation of the video display apparatus with an on-screen display pivoting function according to the present invention will be described.

FIGS. **6** and **7** illustrate data maps which are stored in the case where the on-screen display pivoting function of the invention is not utilized. FIGS. **8** and **9** illustrate data maps which are stored in the case where the on-screen display pivoting function of the invention is utilized. FIG. **10** illustrates the on-screen display displayed in the normal manner in the video display apparatus with an on-screen display pivoting function according to the present invention.

The case where the user does not turn the screen body **11** is the same as the conventional case and, therefore, the operation of this case will be omitted. The case where the user turns the screen body **11** clockwise by 90 degrees will be described.

Further, the operations of the components of the pivot circuit **800** will be described with reference to the B-pivot circuit **800***a*, because the operations of the G and R-pivot circuits **800***b* and **800***c*, respectively, are the same as that of the B-pivot circuit **800***a*.

First, referring to FIG. **3**, the signal converter/clock generator **100** converts the incoming R-G-B signals to digital signals in response to the first control signals **202** of the controller **200**. Further, the generator **100** generates clock signals **101** in response to the horizontal/vertical synchronizing signals so as to meet the operation criteria for the video display apparatus according to the present invention.

The decoder **300** converts the brightness/chromatic signals to digital signals **301** in response to the second control signals **204** of the controller **200**.

The frame rate converter **400** writes the digital R-G-B signals of the signal converter/clock generator **100** into the frame memory **500**. Then, the frame rate converter **400** sequentially reads them for conversion so as to have a certain frequency ratio corresponding to the characteristics of the display panel **1100**.

Then, if the user supplies the OSD driving signal to the controller **200** by manipulating a particular key of the key pad **1105** (see FIG. **10**) of the display panel **1100** to use an on-screen display **1104**, then the controller **200** supplies an OSD control signal **210** to the OSD generator **700** in response to the user's OSD driving signal.

The OSD generator **700** supplies the first R-G-B signals **701** to the analog/digital converter **810** of the pivot circuit **800** in response to the OSD control signal **210**.

Under this condition, the display panel **1100** has been turned by 90 degrees clockwise and, therefore, the user has to supply a mode control signal to the controller **200** by pressing another particular key of the key pad **1105** so that an on-screen display **1104** suitable for the turned status of the display panel **1100** will be displayed.

If the user does not manipulate the particular key to generate the mode control signal, then the on-screen display will be displayed with the letters and figures laid on their side as seen in FIG. **2**.

Conversely, if the mode control signal is generated by the manipulation of the key by the user, then the controller **200** supplies a pivot control signal **212** to the pivot circuit **800** so as to display an on-screen display suitable to the turned status of the display panel **1100**.

Then, the analog/digital circuit **810** of the B-pivot circuit **800***a* of the pivot circuit **800** sequentially receives the B data signals of the first R-G-B signals **701**.

The first to eighth buffers **820***a*, . . . , **820***h*, respectively, of the buffering section **820** store the B data signals of the analog/digital circuit **810**. Then, when the next B data signals are inputted, the preceding 8-bit B data signals are outputted.

That is, if the alphabet character "A" of FIG. **7** is taken as an example, the B data signals of the alphabet character "A" are supplied to the buffering section **820**, starting from the first column C1 in the order of "00000000", "00111100", 00100100", "00100100", "00111100", "00100100", "00100100" and "00000000".

Under this condition, the G and R data signals of the alphabet character "A" are supplied in the same manner.

Then, the pivot controller **840** supplies the store position control signals **841** and the data selection control signals **842** to the data memory **830** and the data selector **850**, respectively.

The data memory **830** then receives the B data signals of the alphabet character "A" from the first to eighth buffers **820***a*, . . . ,**820***h*, respectively, of the buffering section **820** so as to store them.

However, the data memory **830** stores in a position-converting manner the storing address of the B data signals of the alphabet character "A" (which are inputted from the first to eighth buffers of the buffering section **820**) in response to the storing position control signals of the pivot controller **840**.

That is, the B data signals "00000000" which correspond to the first column C1, and which are first outputted from the buffering section **820**, are stored in the first storing positions of the respective columns C1, C2, C3, C4, C5, C6, C7 and C8 of the alphabet character "A" of FIG. **8**, that is, in the storing positions of the first row R1.

The B data signals "00111100" corresponding to the second column C2 for the alphabet character "A" of FIG. **7**, which are outputted next, are stored in the second storing positions of the respective columns C1, C2, C3, C4, C5, C6, C7 and C8 for the alphabet character "A" of FIG. **8**, that is, in the second row R2.

Through this procedure, when the B data signals "00000000" corresponding to the eighth column C8 for the alphabet character "A" of FIG. 7 are stored in the eighth positions of the respective columns C1, C2, C3, C4, C5, C6, C7 and C8, that is, when they are stored in the eighth row R8, the storing of the B data signals for the alphabet character "A" is completed.

The G and R data signals of the alphabet character "A" are stored in the data memory **830** through the same procedure as that of the B data signals. Further, alphabet characters "B", "C" and "D" of FIG. 7 are also stored in data memory **830** through the same procedure.

Then, the data selector **850** receives, from the OSD generator **700**, the B data signals of the first R-G-B signal **701** which have not been converted in accordance with pivoting. Further, the data selector **850** receives, from the data memory **830**, the B data signals of the first R-G-B signals **701** which have been converted in accordance with pivoting.

The data selector **850** selects one set of the B data signals from among the B data signals of the converted first R-G-B signals **701** and the non-converted first R-G-B signals **701** so as to supply them, in the form of second R-G-B signals **801**, to the scale converter **600**.

Under this condition, the display panel **1100** has been turned, and a mode control signal has been generated by the user. Therefore, the data selection control signal **842** is supplied as a signal showing the pivot enable status.

Accordingly, the data selector **850** supplies the B data signals of the converted (converted in accordance with pivoting) first R-G-B signals **701** to the scale converter **600** as second R-G-B signals **801**.

The scale converter **600** receives the second R-G-B signals **801** from the B, G and R-pivot circuits **800***a*, **800***b* and **800***c* of the pivot circuit **800**.

The scale converter **600** converts the second R-G-B signals **801** in response to the scale control signals **208** from the controller **200**.

Then, if the second R-G-B signals **602** which have been scale-converted by the scale converter **600** are outputted, the panel driver **900** receives the second R-G-B signals **602** of the scale converter **600** and provides a driving signal **901** to the display panel **1100** so as to drive the display panel **1100**.

The display panel **1100** receive power from the power supply **1000**, and receives the second R-G-B signals from the panel driver **900**. Further, the display panel **1100** displays the second R-G-B signals on the screen in the form of an on-screen display in response to the driving signal **901** of the panel driver **900**.

In this manner, if the user has turned the display panel **1100** by 90 degrees clockwise, the R-G-B signals of the on-screen display are displayed after being pivoted and, therefore, the letters and figures of the on-screen display **1104** are displayed in the normal manner as seen by the user. This is illustrated in FIG. **10**.

According to the present invention as described above, even in the case where the user turns the screen body by 90 degrees for the sake of convenience, the letters and figures of the on-screen display are displayed in the normal manner as viewed by the user.

Therefore, the user can use the on-screen display in a convenient manner, regardless of the turning or non-turning of the screen body. Further, even in the case where the chromatic signals and synchronizing signals are synthetically inputted instead of the first and second R-G-B signals, the same pivoting function is carried out.

In the above, the present invention was described based on the specific preferred embodiment, but it should be apparent to those ordinarily skilled in the art that various changes and modifications can be added without departing from the spirit and scope of the present invention, which are defined in the appended claims.

What is claimed is:

1. A video display apparatus with an on-screen display pivoting function, comprising:

an on-screen display (OSD) generating section for receiving horizontal/vertical synchronizing signals and clock signals, and for outputting first video signals in response to OSD control signals;

a pivot circuit section for receiving the first video signals, for storing in a position-converting manner a write address of the first video signals in correspondence with a pre-set pivot write address, and for converting the write address in response to the horizontal/vertical synchronizing signals and the clock signals so as to output the first video signals in the form of second video signals;

a scale converting section for furnishing the horizontal/vertical synchronizing signals and the clock signals to said OSD generating section and said pivot circuit section, respectively, and for receiving the second video signals so as to convert scales of the second video signals in response to scale control signals; and

a control section for furnishing the OSD control signals and the scale control signals to said OSD generating section and said scale converting section, respectively, in response to OSD driving signals, and for furnishing pivot control signals to said pivot control section in response to mode control signals generated by a user.

2. The video display apparatus as claimed in claim 1, wherein said pivot circuit section comprises:

an R-pivot circuit for receiving R-data signals of the first video signals from said OSD generating section, for storing in a position-converting manner a write address of the R-data signals in correspondence with a pre-set pivot write address in response to the pivot control signals, and for converting the write address in response to the horizontal/vertical synchronizing signals and the clock signals so as to output the stored R-data signals in a form of R-data signals of the second video signals;

a G-pivot circuit for receiving G-data signals of the first video signals from said OSD generating section, for storing in a position-converting manner a write address of the G-data signals in correspondence with the pre-set pivot write address in response to the pivot control signals, and for converting the write address in response to the horizontal/vertical synchronizing signals and the clock signals so as to output the stored G-data signals in a form of G-data signals of the second video signals; and

a B-pivot circuit for receiving B-data signals of the first video signals from said OSD generating section, for storing in a position-converting manner a write address of the B-data signals in correspondence with the pre-set pivot write address in response to the pivot control signals, and for converting the write address in response to the horizontal/vertical synchronizing signals and the clock signals so as to output the stored B-data signals in a form of B-data signals of the second video signals.

3. The video display apparatus as claimed in claim 2, wherein each of said R, G and B pivot circuits comprises: